

Work Order ID- 83694

\*83694\*

Page 1

May-30-12 7:58:33 AM

Item ID: D350-748-101

Accept

\*N900040100\*

Setup Start \*NS1\*

Revision ID: U/R

Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 4/23/12 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 5/07/12 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start \*NR1\*

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr

Revision Nbr

D350-748-141

F U/R

100

\*100\*

DC

Document Control

DOCUMENT CONTROL

Memo

Photocopy bluefile & type labels per PPPD350-748-101

CHG002

0.00

0.00

MLJ 12/06/26

1 12/06/25

110

\*110\*

CNC Bend 1

CNC Delta 100 Bender

BENDING MACHINE - CROSSTUBES

Memo

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT

0.00

0.00

12-5-10

12-5-10

120

\*120\*

QC

Quality Control

QC15- Crosstube Dimensional Check

Memo

0.00

0.00

12-5-10

Issue P/O to Metcor P/O: 16954 02/12/04 12-5-11  
Rec'd + inspect for transit damage attach cab to

W/O:		83694 WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D350-48-101 PAR #: \_\_\_\_\_ Fault Category: X-tube NCR: ☒ Yes No DQA: AK Date: 12/07/01  
 Resolution: \_\_\_\_\_ Disposition: Rework QA: N/C Closed: OK Date: 12/7/5

NCR: 12-1551		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
12-5-11	118	Tube bent High	CP 12-5-11 12.05.30	Stress relieve then trim to 23.4" high	MO 12-5-15	AK 12-5-15	CP 12-5-11 12.05.30	OK 12/7/01

NOTE: Date & initial all entries

# Work Order ID 83694

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April-23-12 3:59:42 PM

Item ID: D350-748-101

Accept

\*N9000040100\*

Setup Start \*NS1\*

Revision ID: U/R

Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: Date: Tooling: Date:

Run Start \*NR1\*

QC: Date: SPC (Y/N): Date:

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

125

0.00

\*125\*

HandFXtube

Hand Finishing Crosstubes

Memo

\*\*\*Stress relief\*\*\*

Heat treat crosstube as per QSI010 4.3

Temp: \_\_\_\_\_

Start time: \_\_\_\_\_

Finish time: \_\_\_\_\_

N/A sel  
PB. 1

127

QC6- Inspect dimensions to drawing

0.00

\*127\*

QC

Quality Control

Memo

0.00

812614

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

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Item ID: D350-748-101

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\*N9000040100\*

Setup Start \*NS1\*

Revision ID: U/R

Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start \*NR1\*

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

130

0.00

\*130\*

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs,  
Set-up drill table as per QSI 010

2-Deburr

3-Engrave Part # and Batch # as per Dwg D350-748-141

4-Remove all marks from tube within limits of D350-748-141

5- Apply a light coat of LPS3 on the interior of tube

Batch: \_\_\_\_\_

140

QC5- Inspect part completeness to step on W/O

0.00

\*140\*

QC

Memo

0.00

Quality Control

CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)

12-5-17  
mo 12-5-17

12-5-17

12-5-17

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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\*NS1\*

Revision ID: U/R

Stop

\*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Run Start

\*NR1\*

Approvals:

Process Plan:

Date:

Tooling:

Date:

Stop

\*NR2\*

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Tool ID

Tool #

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00

\*150\*

Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O:

Stress relief at 375° for 5 hours

Magnetic Particle Inspect per ASTM E1444

Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2

Embrittle relief at 375° for 8 hours, Chromate Treat

Possible Supplier: Southwest United Industries

Ensure Certificate of Conformity is attached

CL 12/06/04

160

Receive & Inspect for Damage & Mat'l Certs

0.00

\*160\*

Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

12-5-15

☆SEE W/O CHG ATTACHED

170

QC5- Inspect part completeness to step on W/O

0.00

\*170\*

QC

Memo

0.00

Quality Control

POSITIVE RECALL

EFFECTIVE 12-04-14 AUTH

RELEASED 12/15/26 DATE

NDT

P/O: 17258

CL 12/06/19 K1

LOAD TEST

rec'd.

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: Date: Tooling: Date:

Run Start \*NR1\*

QC: Date: SPC (Y/N): Date:

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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180

0.00

\*180\*

SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside crosstube as per QSI 005 4.2

2-Prime Outside of Tube as per Dart QSI 005 4.2

B121746 - start: 12:30  
Finish: 1:15  
B121625 - start: 5:15  
Finish: 5:45

AP 12-6-21

190

0.00

\*190\*

QC14- Inspect Spray Paint

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

1 12/06/24

200

0.00

\*200\*

Crosstubes

Crosstubes

Memo

0.00

Crosstubes

1-Install Ground wire Insert, then insert screw and washer

2-Install Abrasion strips as per Dwg D350-748-141 & QSI 035.

3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS

1 12/06/24

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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Setup Start \*NS1\*

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Stop \*NS2\*

Item Name: Crosstube Installation, High Fwd

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start \*NR1\*

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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210 QC5- Inspect part completeness to step on W/O 0.00

\*210\*

QC Memo 0.00

Quality Control

Q B 120625

220 Pick Kit 0.00

\*220\*

Packaging Memo 0.00

Packaging

120625

230 QC4- 100% Inspect kits for completeness 0.00

\*230\*

QC Memo 0.00

Quality Control

1 M 120625

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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**NOTE:** Date & initial all entries

# Work Order ID 83694

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Item ID: D350-748-101

Accept

\*N900040100\*

Setup Start \*NS1\*

Revision ID: U/R

Item Name: Crosstube Installation, High Fwd

Stop \*NS2\*

Start Date: 23/04/2012 Start Qty: 1.00

\*1\*

Cust Item ID:

Required Date: 07/05/2012 Req'd Qty: 1.00

\*1\*

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_  
QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start \*NR1\*

Stop \*NR2\*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
*240*	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: _____								
	PPP Rev: _____								
250	QC21- Final Inspection - Work Order Release	0.00							
*250*									
QC	Memo	0.00							
Quality Control									

K SP  
12-6-28

MW 12/06/26  
MW 12/06/25

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

May-30-12 7:58:33 AM

Page 1

Work Order ID: 83694

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 4/23/12

Required Date: 5/07/12

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ VERIFY BY:DD  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F 10.08.04 added QSI010  
 4.3 DD verf:EC  
 IPP REV:G ADD UNDER BEND COMMENT 12-05-28 JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
ALS4-1032-225 Insert		Purchased	No			200	Each	819.0000	1	1		12-06-24	

Location Loc Qty Loc Code

ST281 796  
 108696 146  
 110768 62  
 118386 55  
 118966 68  
 121269 465  
 ST282 23  
 120410 10  
 120451 13

118520

AN4-41A  
 Bolt

Purchased No

220 Each 539.0000

8 8

50 12-6-25

Location Loc Qty Loc Code

360 181  
 121185 181  
 ST360 358  
 115108 3  
 115705 7  
 118451 29  
 118838 50  
 119328 100  
 120423 150  
 121205 15  
 121573 4

2x

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Page 2

Work Order ID: 83694

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 4/23/12

Required Date: 5/07/12

Start Qty: 1.00

Required Qty: 1.00

AN4-6A Purchased No 220 Each 1,514.0000 16 16 *sf*

Bolt

Location	Loc Qty	Loc Code
355	222	
121631	222	
ST356	1292	
119017	792	<i>rb</i>
121243	500	

AN5-32A Purchased No 220 Each 245.0000 4 4 *sf*

Bolt

Location	Loc Qty	Loc Code
ST339	145	
119862	50	
120423	75	
120910	20	<i>4</i>
ST340	100	
121541	100	

AN960JD10 WASHER1149D0363J Purchased No 200 Each 0.0000 1 1 *120824*

Washer

AN960JD416 WASHER1149D0463J Purchased No 220 Each 30.0000 32 *120912 sf*

Washer

Location	Loc Qty	Loc Code
ST351	30	
116289	10	
119097	20	

AN960JD516 WASHER1149D0563J Purchased No 220 Each 0.0000 8 *119546 12-6-25*

Washer



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Start Date: 4/23/12

Required Date: 5/07/12

Start Qty: 1.00

Required Qty: 1.00

D2856-400 Manufactured No 200 f 242.5445 1.181 1.2431579 *12/06/12*  
Abrasion Strip

Location	Loc Qty	Loc Code
ST403	216	
81875	216	
ST409	26.5445	
63735	0.6696	
68076	0.3149	
71164	8.46	
79551	17.1	

D3500-1 Manufactured No 220 Each 75.0000 4 *SD*  
Saddle

Location	Loc Qty	Loc Code
ST423	14	
78595	14	
ST424	31	
73405	20	
73406	8	
76000	3	
ST425	30	
76940	30	

D3501-1 Manufactured No 220 Each 367.0000 16 16 *12/06/12*  
Bushing

Location	Loc Qty	Loc Code
ST051	367	
67757	4	
73391	6	
74866	207	
77033	61	
81955	26	
83253	63	

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Shop Packet Print

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Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 4/23/12

Required Date: 5/07/12

Start Qty: 1.00

Required Qty: 1.00

D3502-1 Manufactured No 200 Each 21.0000 2 2 12 06 24  
Support

77041

Location	Loc Qty	Loc Code
ST051	21	
73419	11	
74873	10	

D350-748-141TRN Manufactured No 110 Each 3.0000 1 1  
Crosstube Turning Detail

Location	Loc Qty	Loc Code
LG	3	
74718	1	
83277	1	
83278	1	

①

JW 12-5-10

MS21042L4 Purchased No 220 Each 4,059.0000 24 24 50  
Nut

Location	Loc Qty	Loc Code
ST300	4059	
119075	125	
121011	677	
121444	2957	
121652	300	

24

MS21042L5 Purchased No 220 Each 1,447.0000 4 4 50 12-6-25  
Nut

Location	Loc Qty	Loc Code
300	500	
121652	500	
ST300	947	
108827	8	
116105	5	
116548	43	
117611	18	
119109	865	
17651	8	

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Shop Packet Print

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Parent Item Name: Crosstube Installation, High Fwd

Start Date: 4/23/12

Required Date: 5/07/12

Start Qty: 1.00

Required Qty: 1.00

MS21920-20 Purchased No

200 Each 86.0000 2 2

*W/12 06 24*

Clamp (per MIL-DTL-8783C)

Location	Loc Qty	Loc Code
LG050	86	
116799	8	
120676	8	
121067	20	
121274	50	

MS27039-1-10 Purchased No

200 Each 126.0000 1 1

*W/12 06 24*

Screw

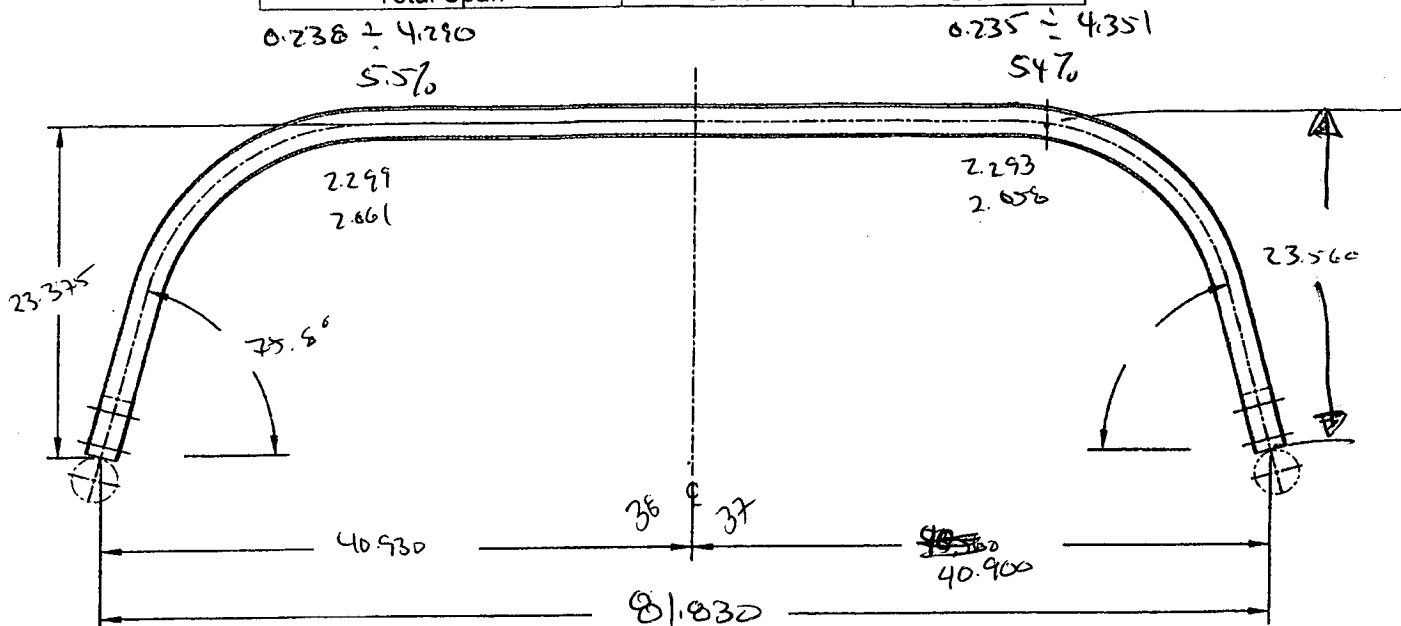
*122027*

Location	Loc Qty	Loc Code
GA	100	
120449	100	
ST291	26	
120120	26	

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 83694
<b>Description:</b> Crosstube High Fwd (AS350/355)	<b>Part Number:</b> D350-748-101
<b>Inspection Dwg:</b> D350-748-141	<b>Rev:</b> F
	<b>Page 1 of 1</b>

Bend

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Side A = 5.5% crush @ 38 Passes
Side B = 5.4% crush @ 37 Passes
Twist = 0.023"

Trim to 23.40 HIGH AFTER STRESS RELIEF 4/12/05/11

QC15 Inspection	8
Date	12/05/10

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

# GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 30.45 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO  
BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO  
VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE,  
CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE  
OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES,  
NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY.  
CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE  
MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO  
CRACKING/CHIPPING/GROOVES.
- TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT  
NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN  
CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

CTC  
WORK C  
NO. 83694 MLJ  
12/04/24

UNDER REVIEW

11.07.12

RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A8-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	08.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	10.11.23		

DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D350-748-141	REV. F SHEET 1 OF 4
TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE N
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

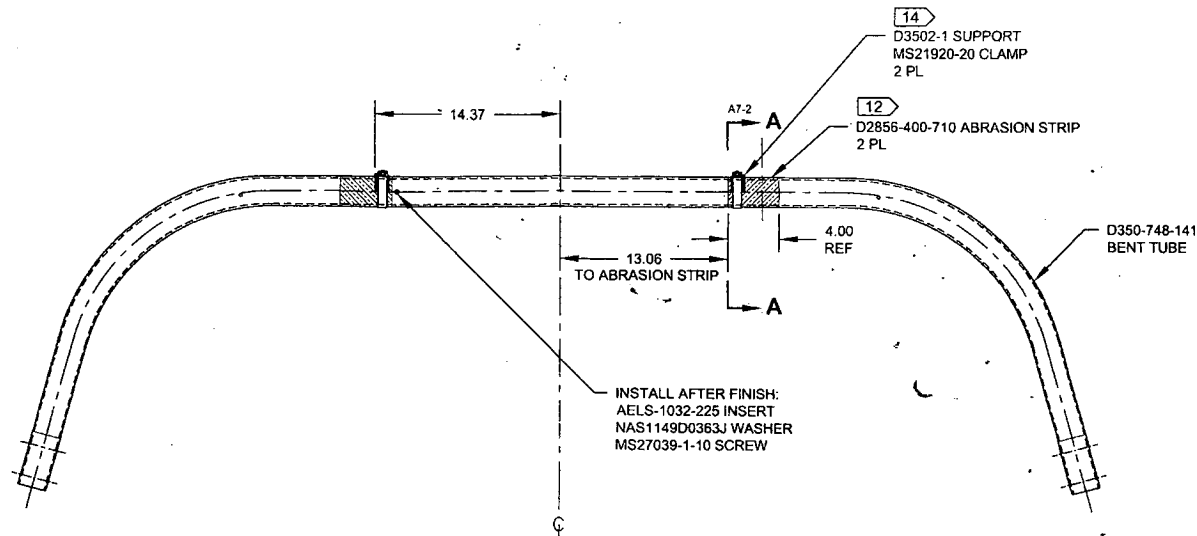
Part No: \_\_\_\_\_ PAR.#: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

83694

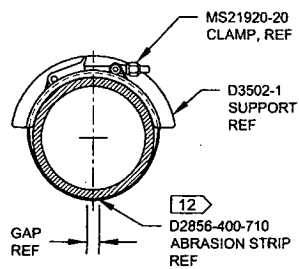


**D350-748-141  
ASSEMBLY DETAIL**

UNDER REVIEW

11.07.11

RELEASED  
2011-01-38



**SECTION A-A** D4-2  
SCALE 4X

DESIGN		<b>DART AEROSPACE LTD</b>	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-141	SHEET 2 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
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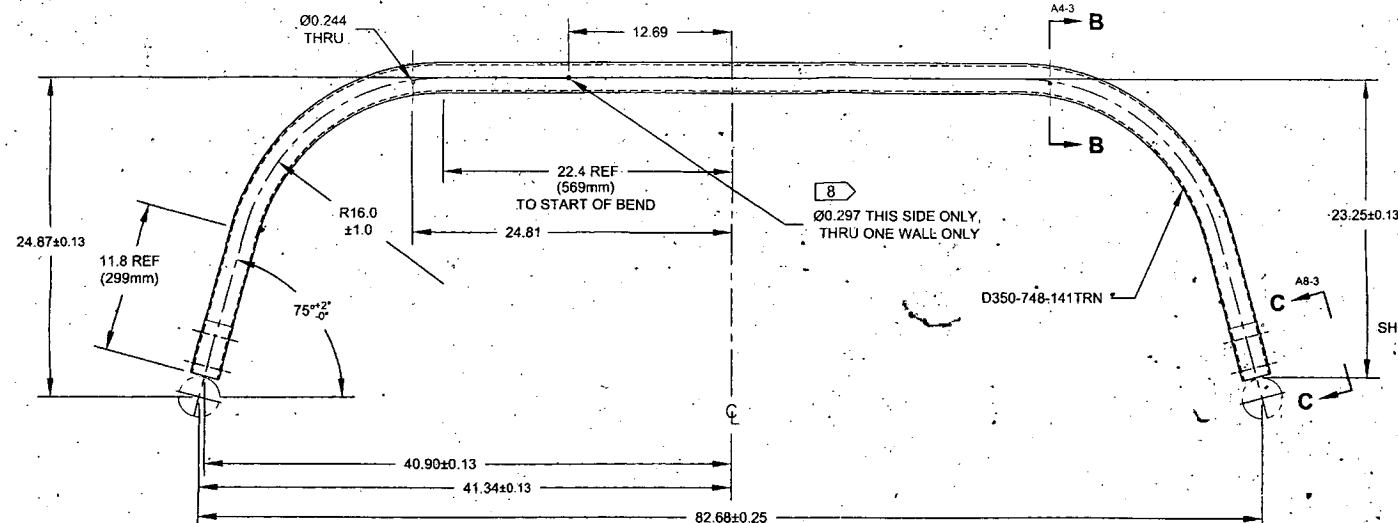
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

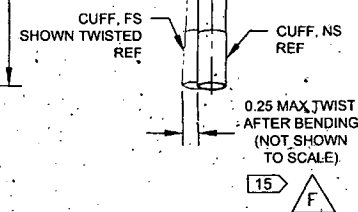
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

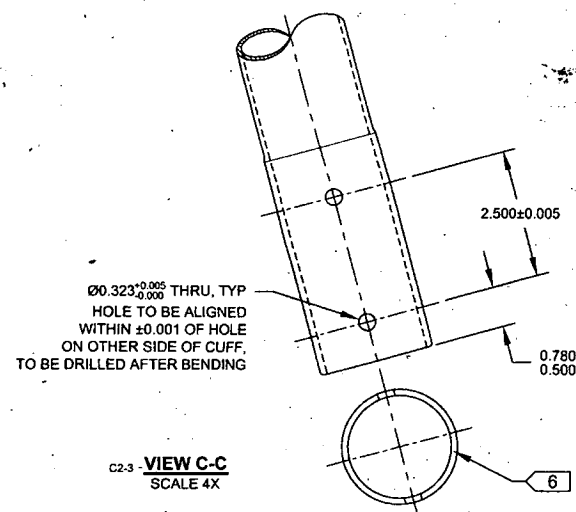
NOTE: Date & initial all entries



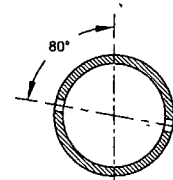
83694



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10



C2-3 - **VIEW C-C**  
SCALE 4X



**SECTION B-B** D3-3  
SCALE 4X

UNDER REVIEW  
11.27.12

RELEASED  
2011-01-18  
JMD

DESIGN	qp	<b>DART AEROSPACE LTD</b>	
DRAWN	qp	HAWKESBURY, ONTARIO, CANADA	
CHECKED	h	DRAWING NO.	REV. F
MFG. APPR.	h	D350-748-141	SHEET 3 OF 4
APPROVED	h	TITLE	SCALE
DE APPR.	h	CROSSTUBE (AS 350/355 HI FWD)	NTS
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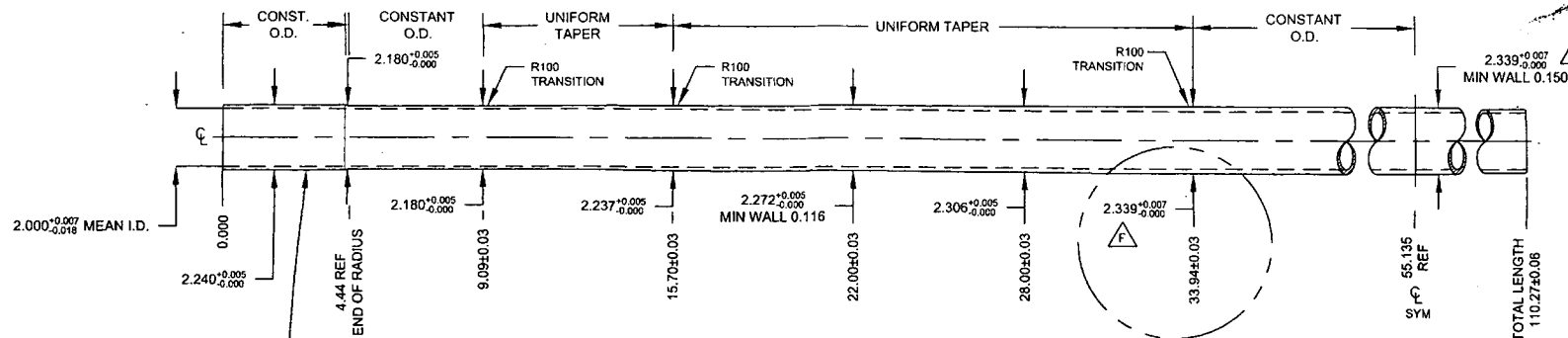
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

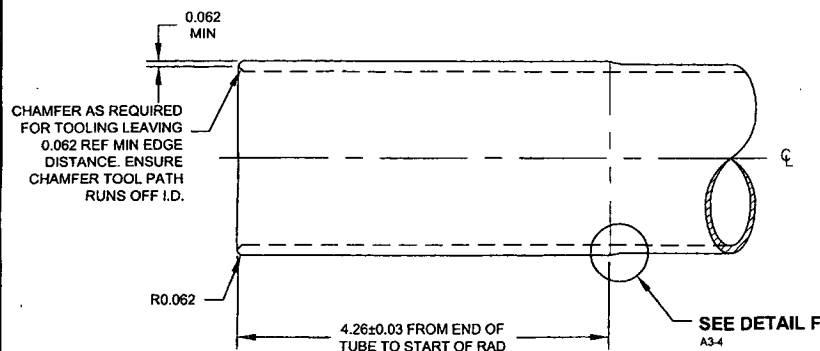


SEE DETAIL D  
A6-4

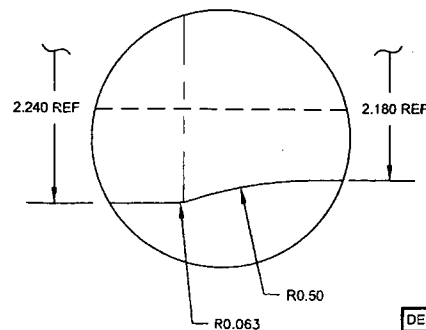
SEE DETAIL E  
A1-4

UNDER REVIEW  
11.07.12

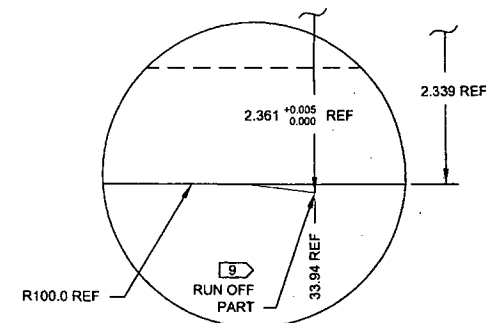
**D350-748-141TRN  
TURNING DETAIL**



**DETAIL D:  
CROSSTUBE CUFF** C7-4  
SCALE 3X



**DETAIL F:  
CUFF TRANSITION** A5-4  
NOT TO SCALE



**DETAIL E:  
TAPER RUN-OFF** C3-4  
NOT TO SCALE

**RELEASED**  
2011-01-18

DESIGN		<b>DART AEROSPACE LTD</b>	
DRAWN		HAWKESBURY, ONTARIO, CANADA	
CHECKED		DRAWING NO.	REV. F
MFG. APPR.		D350-748-141	SHEET 4 OF 4
APPROVED		TITLE	SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD)	NTS
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W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
11.10.05	161	LOAD TUBE TO 3500 <sup>lb</sup> FOR 1 MINUTE. REF D.S. EMAIL.		CP 12/6/18	1	CP 12/6/18	
11.10.05	162	NDT TUBE.					

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

## Chris Provencal

---

**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

DRAWING NO. D350-748-141	TITLE CROSSTUBE (AS 350/355 HI FWD)	REV. F	DART AEROSPACE LTD ENGINEERING ORDER		D.E.O. NO. D350-748-141-F-1	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>UP</i>	CHECKED <i>[Signature]</i>	MFG. APPR. <i>[Signature]</i>	APPROVED <i>[Signature]</i>		DE APPR. <i>[Signature]</i>		
DATE 12.04.02	DATE 12.04.03	DATE 12.04.03	DATE 12.04.03		DATE 12.04.03		

**PURPOSE:**

ADD A STRESS RELIEF OPERATION FOLLOWING BENDING

**CHANGE:**

ADD

10) AFTER BENDING: STRESS RELIEF AT 650°F ± 25°F FOR A MINIMUM OF 2 HRS.  
AIR COOL TO AMBIENT TEMPERATURE  
(REF. AMS2759/1E)





Metcor Inc.  
560, boul. Arthur-Sauvé  
St-Eustache (Québec) J7R 5A8  
TEL : 450-473-1884  
Télécopieur : 450-491-5498  
Télécopieur : 450-491-6454

# **Certificat de Conformité** **Certificate of Compliance**

BON DE TRAVAIL order	CHARGEMENT load
175926	1

CLIENT / customer 215  
DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K6A 1K7

LIVRÉ À / shipped to:  
DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K6A 1K7

COMMANDE DU CLIENT customer po	BON DE LIVRAISON DU CLIENT customer shipper no.	MATÉRIEL material	CODE DE TRAITEMENT mat'l heat code	NUMÉRO DE LOT lot number
16954		Steel		

## **SPÉCIFICATIONS DU PROCÉDÉ** processing specifications

STRESS REL

SAE AMS 2750/1 REV.E

EXIGENCE / requirement SPÉCIFICATIONS / specified TESTS EXÉCUTÉS / performed RÉSULTATS DE TESTS / results  
Visual

QUANTITÉ quantity	POIDS weight	DESCRIPTION DES PIÈCES parts description
7	210	D350-748-101 (1) CROSS TUBE  (1) D350-748-101 CROSS TUBE  (1) D350-748-101 CROSS TUBE  (1) D350-748-101 CROSS TUBE  (1) D350-748-101 CROSS TUBE  (1) D350-748-101 CROSS TUBE  CONTENANT: 1 PALETTE

Melcor Inc.  
560, boul. Arthur-Sauvé  
St-Eustache (Québec) J7R 5A8

**Certificat de Conformité**  
**Certificate of Compliance**

BON DE TRAVAIL order	CHARGEMENT load
175926	1

 **Metcor Inc.**

CLIENT / customer 215  
DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K8A 1K7

LIVRÉ À / shipped to:  
DART AEROSPACE  
1270 ABERDEEN  
HAWKESBURY

ON K8A 1K7

COMMENTAIRES / COMMENTS

INSPECTEUR / inspector:



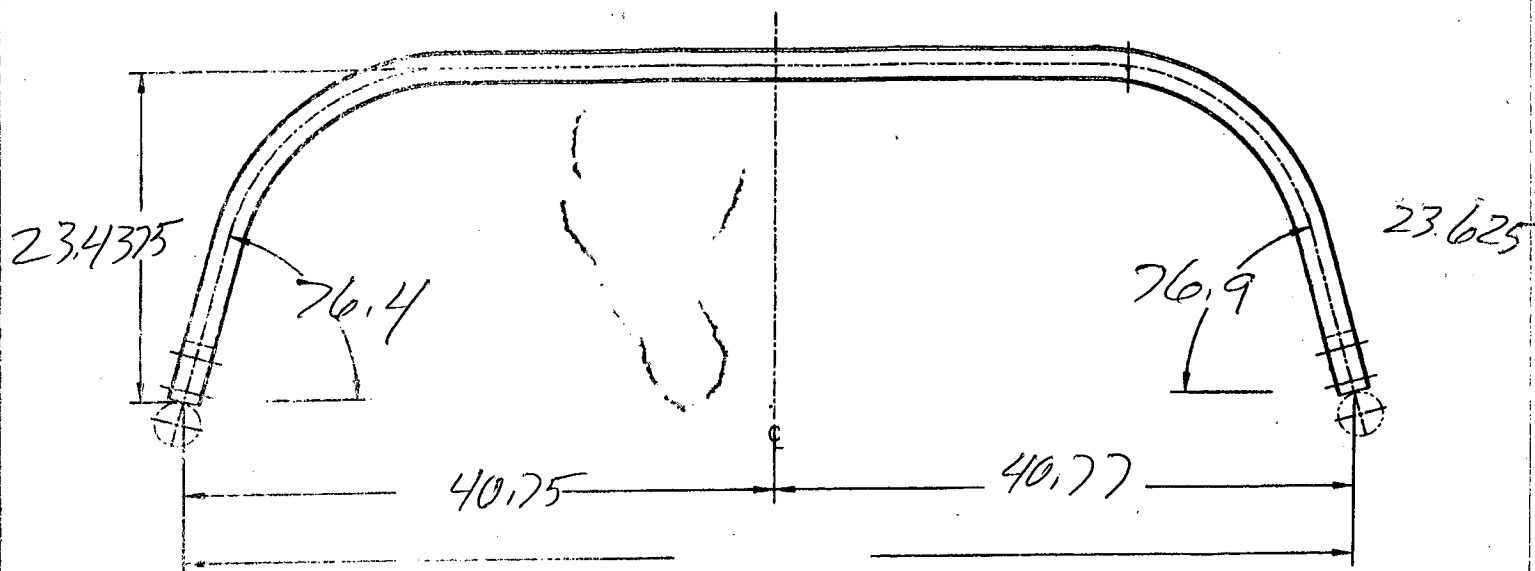

DATE: 2012-05-14



DART AEROSPACE LTD		Work Order:	83694
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: F		Page 1 of 1	

Stress

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



DP 12-5-14

Comments
TWIST 0.056"
Cut to 23.43 High. Acceptable CP 12.05.15 CPD 442

QC15 Inspection	
Date	

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	
C	11.11.07	Dwg Rev updated	KJ	



**CERTIFICATE OF  
CONFORMANCE**

**CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1**

**DATE:** Jun-12-2012

**CONSIGNED TO:** Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

**W/O #:** 114966

**INVOICE #:** 60875

**CONTRACT OR  
PURCHASE ORDER #** PO17084

**DESCRIPTION:** CROSSTUBE

**QTY** 1

**P/N #** d350-748-101

**S/N #** 83694

STRESS RELIEVE HEAT CHART # 12-546. MPI-IAW ASTM-E-1444.  
CADMIUM PLATE IAW AMS-QQP-416C TYPE 2 YELLOW CLASS.  
BAKE HEAT CHART # 12-573. MPI IAW ASTM-E1444.

8/17/06/18

**CERTIFICATE:** I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

**Approved Inspector:**



## LIQUID PENETRANT TEST REPORT

P- 12487

ENT DART AERO SPACE DATE JUNE 19/2012 PAGE 1 OF 1  
ENTION MATT / LINDA ACUREN JOB NO. 188-12-C0765  
ADDRESS 1220 ABERDEEN ST. PO/VO NO. 17084  
HANKS BURY, ON. WORK LOCATION JAME  
ACCEPTANCE STD. ASTM 1417/01-038 REV./DATE 2005  
PROJECT F.P.I. ON CROSS TUBES  
ITEM(S) EXAMINED (6 PCS) SEE RESULTS

JOB DESCRIPTION PROCEDURE NO. LT-002 REV./DATE 2008 TECHNIQUE NO. LT-002 REV./DATE 2008  
PART NO. SEE RESULTS MATERIAL 4130 STEEL THICKNESS VARIOUS  
SCOPE 4 WET FLUORESCENT LIQUID PENETRANT  
INSPECTION WAS DONE 100% ON THE EXTERNAL SURFACE ONLY

TEST DETAILS  
METHOD ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
DYE MAGNAFLUX BLACK LIGHT S/N 16459 OUTPUT > 1000  $\mu$ W/cm<sup>2</sup> AMBIENT < 2 fc  
RETRAINER ZL07 MINIMUM DWELL TIME 45 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
RETRAINER REMOVER H2O MINIMUM DRY TIME > 10 MIN. OTHER LABINO  
DEVELOPER SKD52 MINIMUM DWELL TIME 10 MIN. LIGHT METER S/N 1098866 CAL DUE DATE JULY 28-2012  
DEVELOPER TYPE ☒ NON AQUEOUS ☐ AQUEOUS ☐ DRY

TEST SURFACE  
SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/20°F ☐ -4°C/20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS- ☒ METRIC ☐ IMPERIAL

W.O.	CROSS TUBES		
1	83700	✓	
1	83695	✓	
1	83694	✓	
1	84381	✓	
1	81516	✓	
1	83299	✓	

12 06 19

Scope of Services  
The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

Standard of Care  
In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

SIGNATURES  
CLIENT REPRESENTATIVE Matthew Murdoch PRINT Matthew Murdoch SIGNATURE  
TECHNICIAN (SIGNATURE): Mike Johnson  
NAME (PRINT): Mike Johnson 1<sup>ST</sup> TECHNICIAN  
CGSB LEVEL II SNT LEVEL II CGSB LEVEL II SNT LEVEL II  
CGSB REG. NO. 0606 CGSB REG. NO. 0606  
DTR # E-63501  
REPORT REVIEWED BY: NAME INITIALS

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CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

